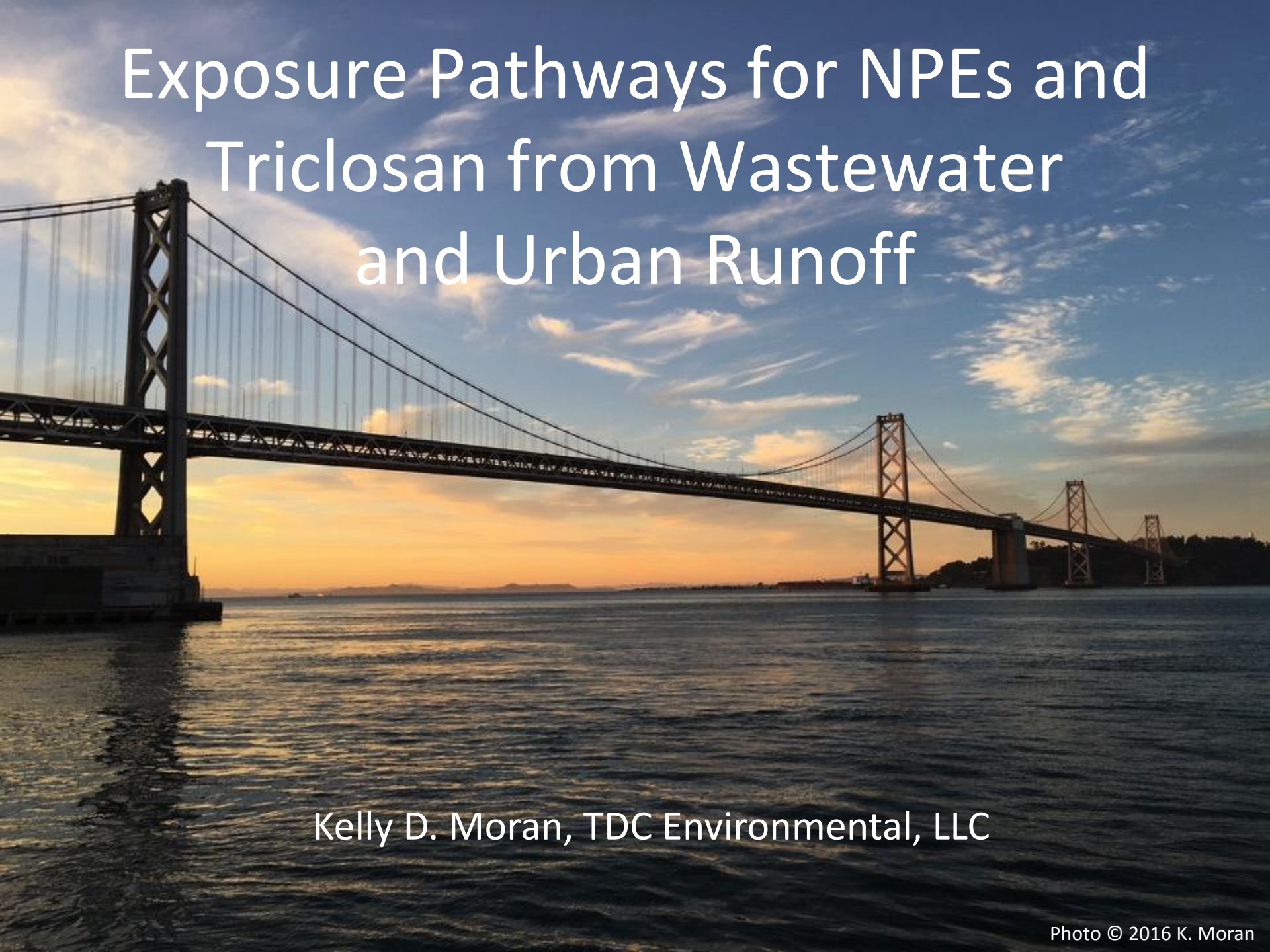
Exposure Pathways for NPEs and Triclosan from Wastewater and Urban Runoff



Kelly D. Moran, TDC Environmental, LLC

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Connecting Consumer Product Use to Surface Water

Two Drainage Systems

Storm Drain

Sewer

Photos © 2015 K. Moran

Sewer

POTW (WWTP)

Continuous Discharges

Cleaning and Personal Care Products
Clothing/Fabric Treatments

Widespread, Relatively
Steady Discharges to POTWs

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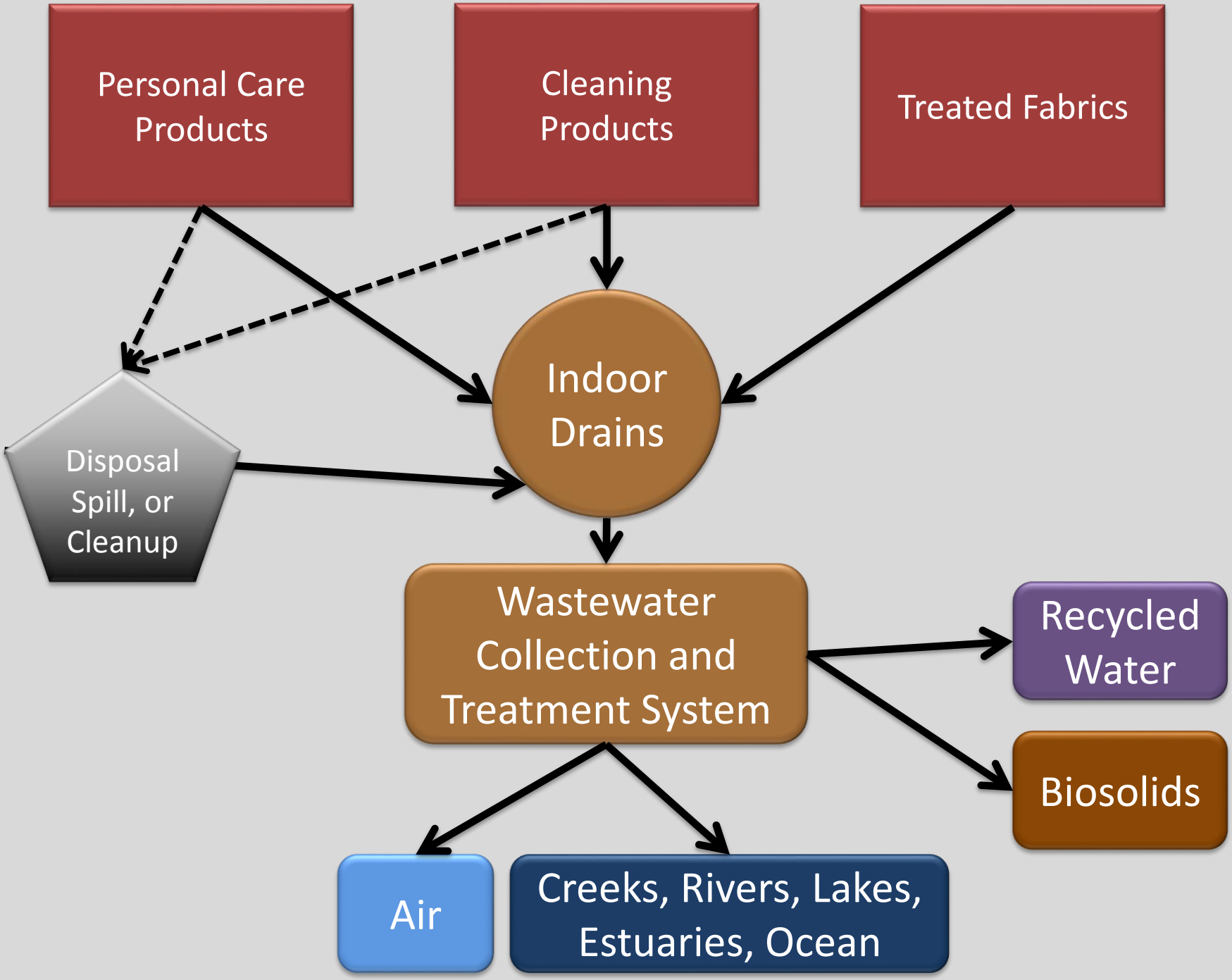

Personal Care Products
Cleaning Products
Treated Fabrics
Indoor Drains
Disposal Spill, or Cleanup
Wastewater Collection and Treatment System
Recycled Water
Biosolids
Air
Creeks, Rivers, Lakes, Estuaries, Ocean

Dilution Reduced by Water Conservation

Low flow toilets, washers & showers => Reduced POTW flows

Location	Per Capita Indoor Water Use (Liters)	Source
USA 1996	**388**	USEPA POTW survey
California Jan. 2016 (includes outdoor)	**230** (Statewide) <**190** (Many cities)	CA State Water Board

Zero Dilution POTW Effluent Common

- California “Effluent dominated waters” include creeks, rivers, portions of estuaries
- Many POTWs have ZERO effluent dilution in NPDES permits
  - California ≈20% of permits zero dilution
  - Effluent >90% of stream flow for 49% of a representative sample of major POTWs in TX, OK, NM, AR, LA*
- USA ≈23% of POTWs have <10x dilution*
- “Diluting” waters can contain the pollutant

*Brooks et al. 2006. *Hydrobiologia* **556**:365–379

Other POTW Considerations

1. Wastewater as a Resource
   - Irrigation
   - Human consumption: potable reuse
2. Biosolids – a resource not a waste
3. POTW Operational interference
   - Biological Processes
     - OPPTS 835-3240 Activated sludge respiration inhibition
4. US Clean Water Act Compliance
   - Toxicity and other narrative standards

100% of POTWs must comply with the Federal Clean Water Act 100% of the time

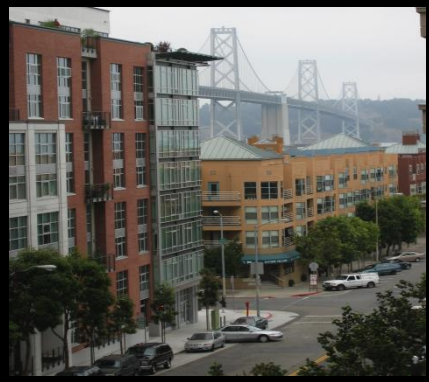
Storm Drain

Episodic discharges (rainfall / runoff)
Continuous discharges (irrigation/other)

Paint & Other Building Materials Exposed to Rain

Widespread, primarily episodic discharges to storm drains

Weathering often modifies leaching rates



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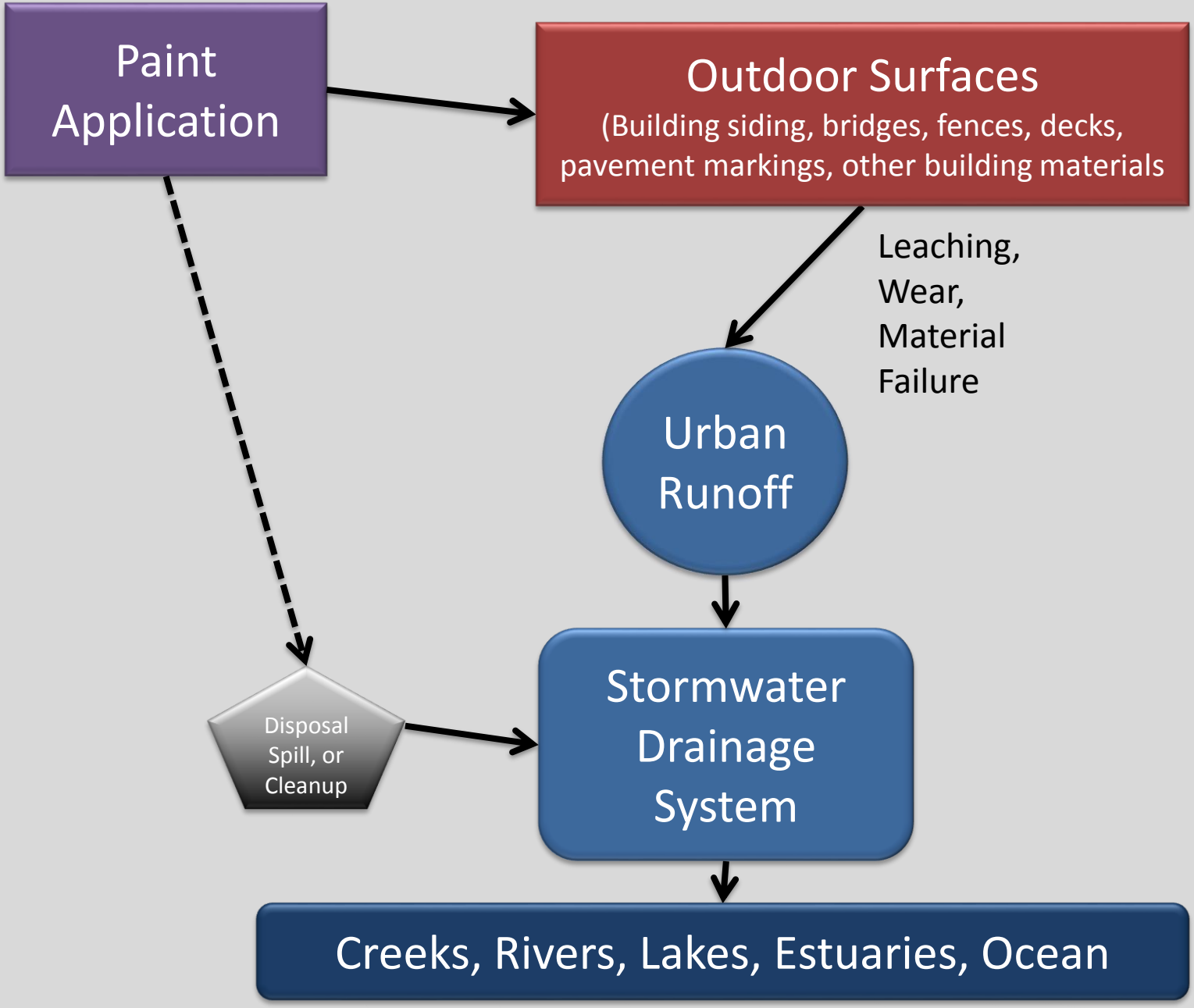
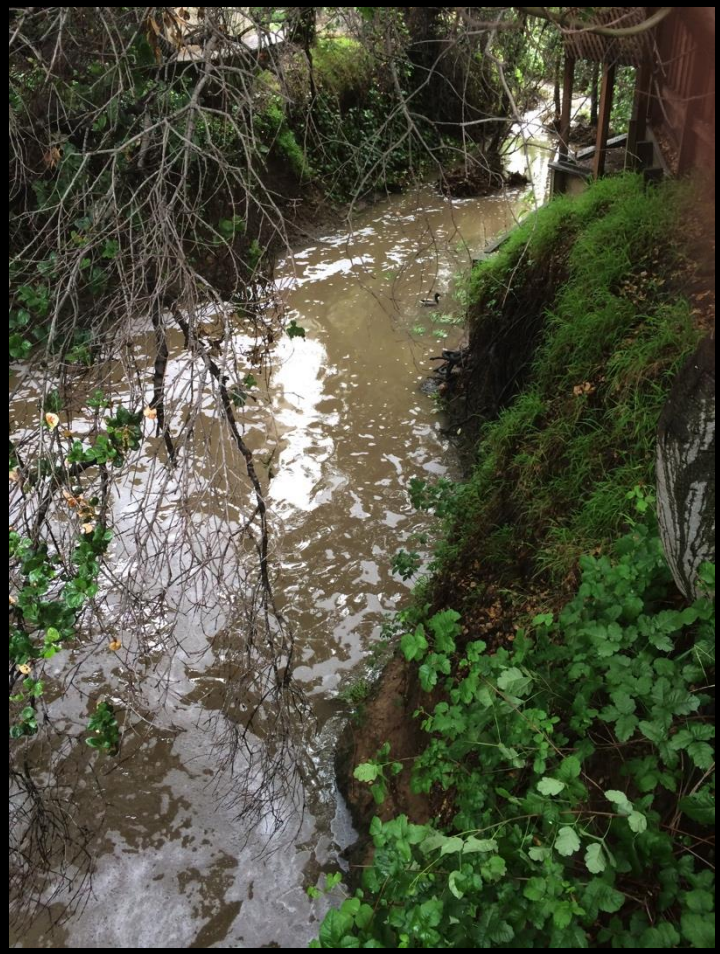

Paint Application
Outdoor Surfaces
(Building siding, bridges, fences, decks, pavement markings, other building materials
Leaching, Wear, Material Failure
Urban Runoff
Disposal Spill, or Cleanup
Stormwater Drainage System
Creeks, Rivers, Lakes, Estuaries, Ocean

Zero Dilution Urban Runoff is Norm in Wet Weather in California Creeks

Trickles can become torrents when it rains

Dry weather flow may be low dilution as well



Triclosan Alternatives?

- > 250 EPA-Registered antimicrobials
- FDA also regulates antimicrobials in products
- Typical antimicrobial purposes:
  - Protect products – e.g., chemicals that prevent bacteria growth, odor, mildew
    - Usually lower concentration
  - Protect user or application site – e.g., disinfectants/ sanitizers for surfaces, drinking water, swimming pools; boat bottom paint; cooling water biocides
    - Usually higher concentration

Triclosan Alternatives?

Other Antimicrobials Have Potential to Cause Water Pollution

Example: Informal POTW watch list based on EPA reviews, scientific literature

- High aquatic toxicity (most sensitive standard test species)
- Use pattern linked to sewer discharges
- Monitoring data (if available) and/or EPA modeling close to or exceeding aquatic toxicity threshold

Not comprehensive - Not necessarily Triclosan alternatives

Informal POTW Antimicrobials Watch List

1,2-Benzisothiazolin-3-one (BIT)
Bronopol (Bioban)
Busan 1024
Carbendazim (MBC)
Chlorhexidine
Chlorinated isocyanurates
DIDAC
Folpet
Fludioxonil
Halohydantoins
Imidazolidinedione
IPBC
o-Benzyl-p-chlorophenol
Octhilinone
o-Phenyl phenol
Polyhexamethylenebiguanide (PHMB)
Triclosan

Not comprehensive - Not necessarily Triclosan alternatives

Thank you

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